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(54) **FUSIBLE LINK FOR CABLE ASSEMBLY AND METHOD OF MANUFACTURING SAME**

(75) Inventors: **Seibang Oh**, Elk Grove Village; **Cesario Herbias**, Calumet City; **Demetrios Thanopoulos**, Arlington Heights, all of IL (US); **Jozef Philoteus Maria Johannes Jaspar**, Tiel (NL)

(73) Assignee: **Littelfuse, Inc.**, Des Plaines, IL (US)

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(51) **Int. Cl.**^{7} **H01R 4/00**
(52) **U.S. Cl.** .... **174/84 R**
(58) **Field of Search** .... 174/84 R, 84 C, 174/74 R, 79, 35 C; 439/893, 621

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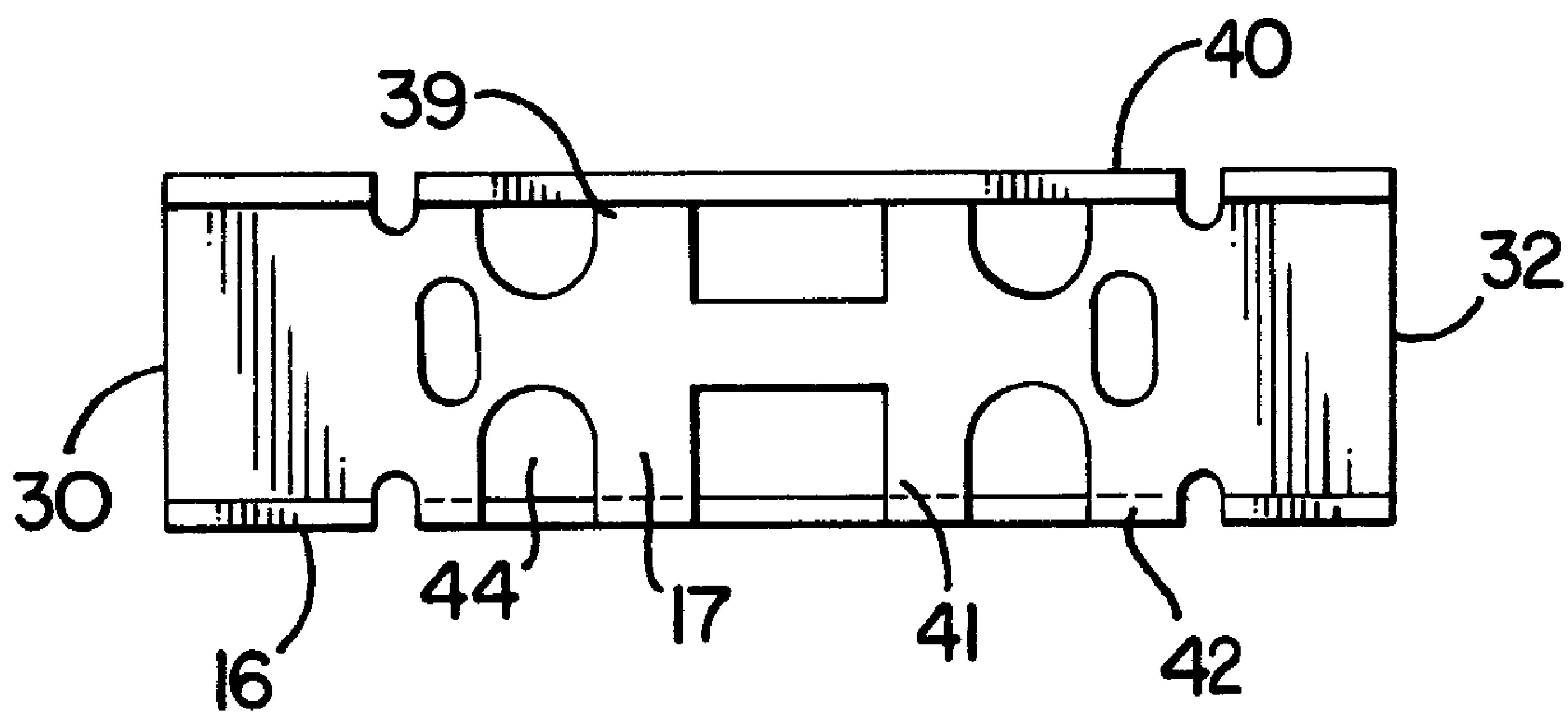
Primary Examiner—Dean A. Reichard
Assistant Examiner—William H. Mayo, III
(74) *Attorney, Agent, or Firm*—Bell, Boyd & Lloyd LLC

(57) **ABSTRACT**

A fusible link for a cable assembly is provided. The fusible link has a link segment having a first member extending transversely from the link segment, and a second member extending transversely from the link segment. A first end of the link segment engaging a first cable of the cable assembly, and a second end of the link segment engaging a second cable of the cable assembly. A method of manufacturing the fusible link is also provided.

30 Claims, 2 Drawing Sheets



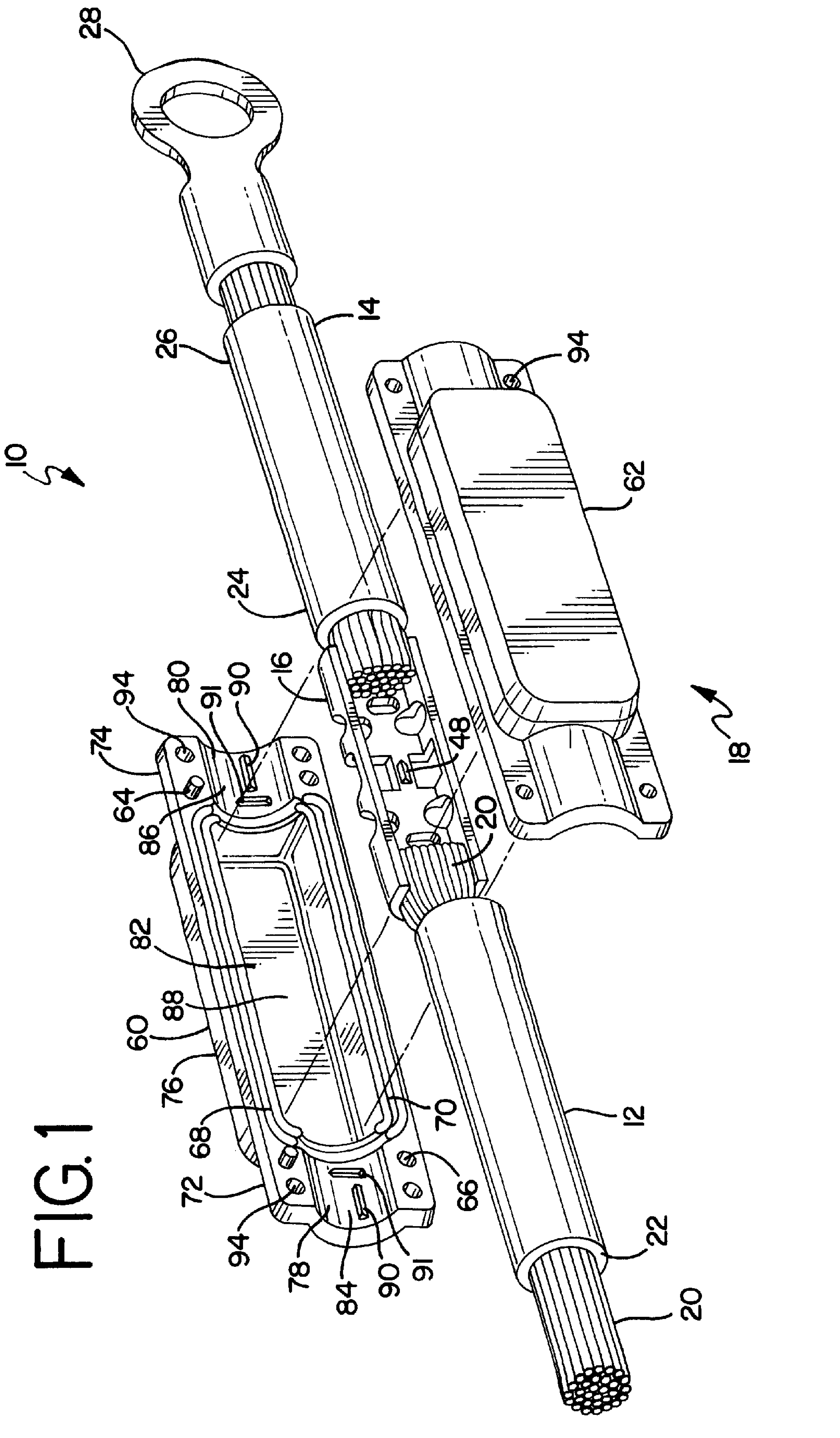

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FIG.1

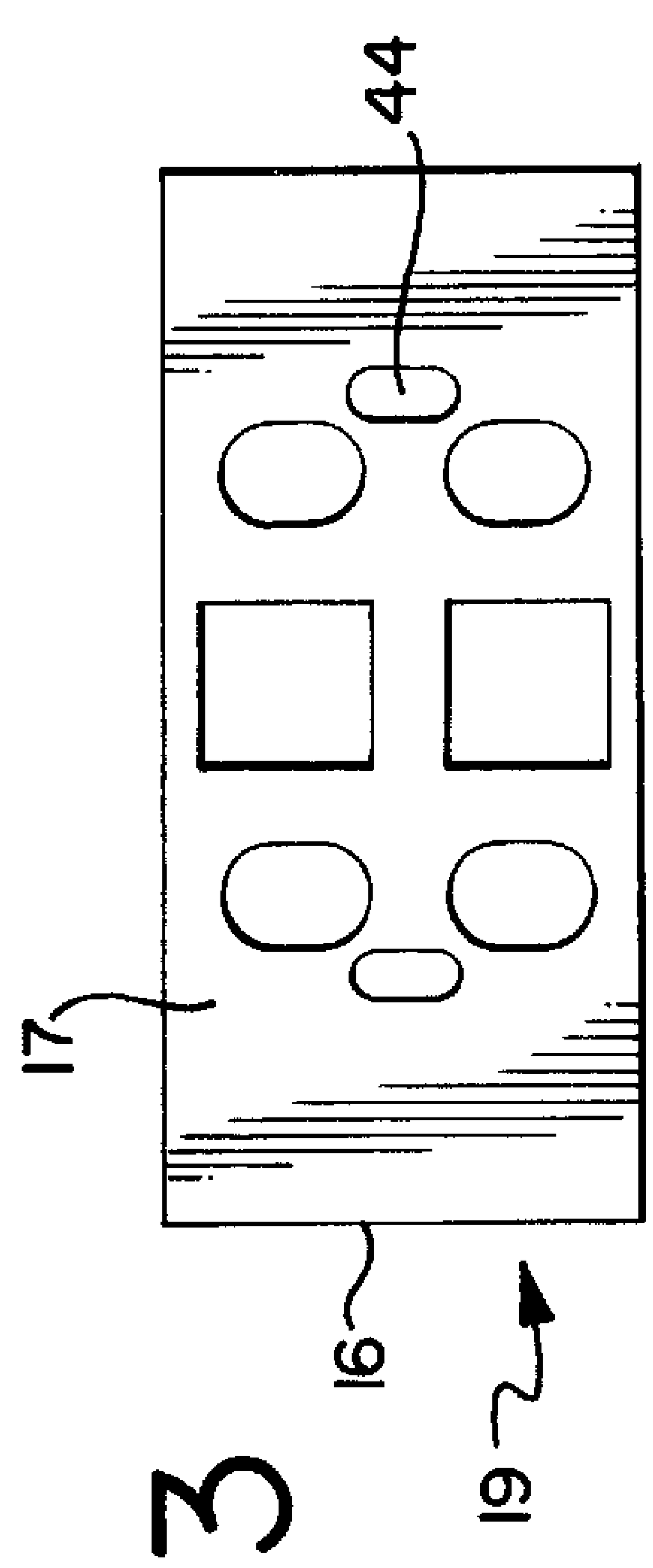

FIG.3

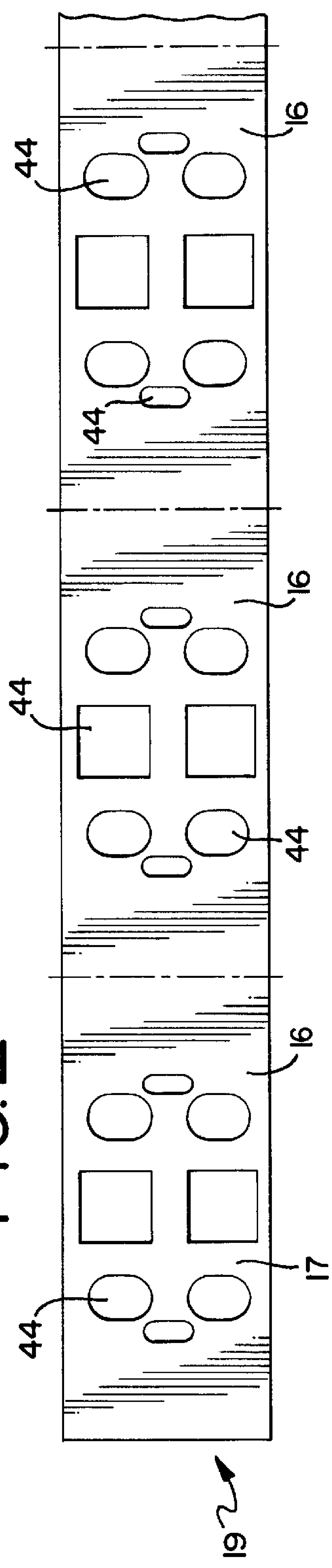

FIG.2

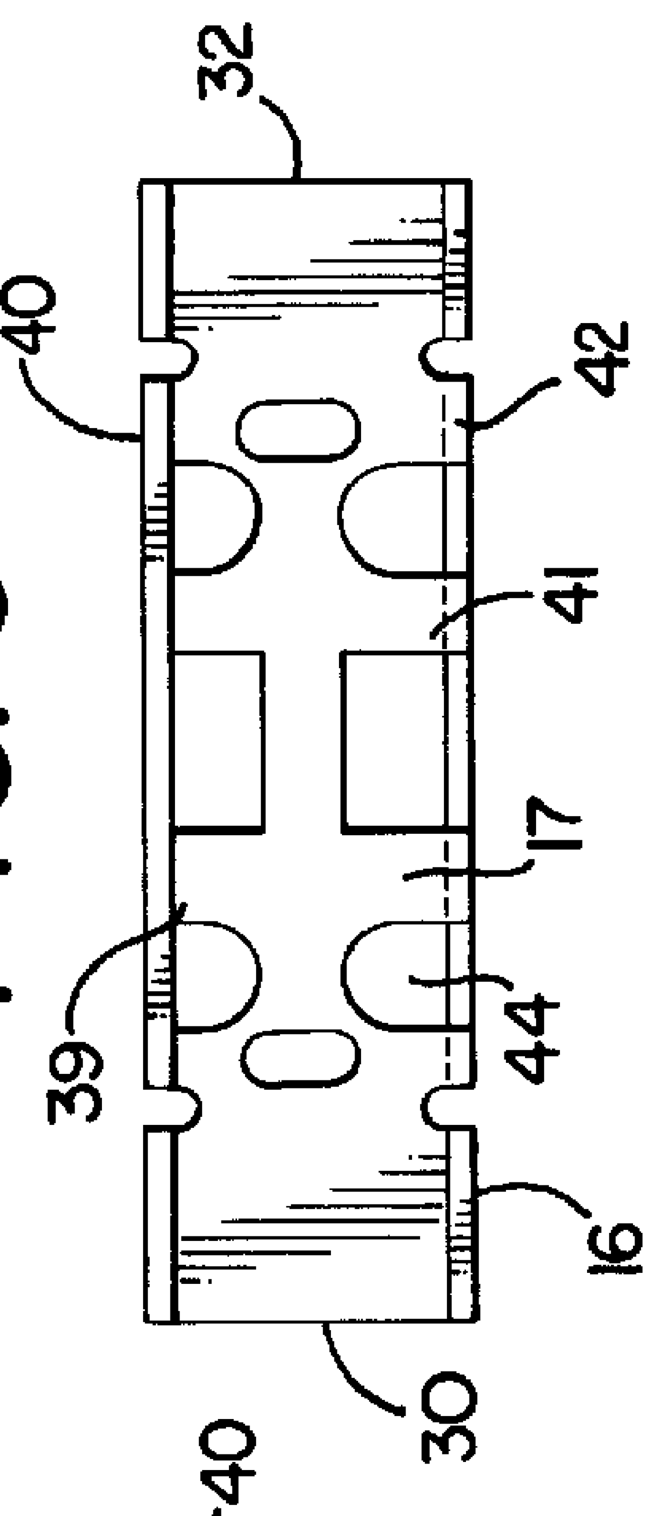

FIG.6

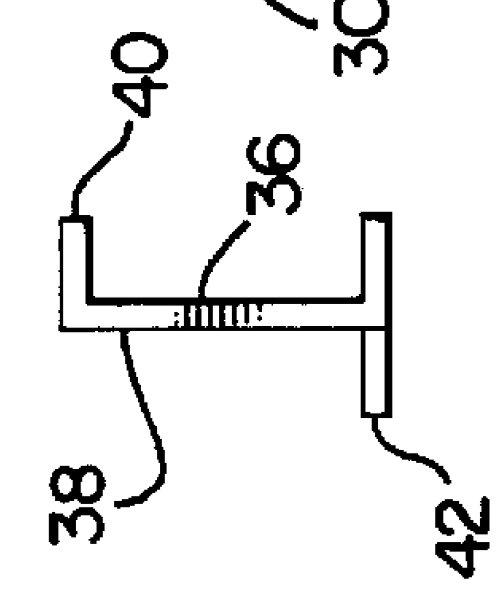

FIG.7

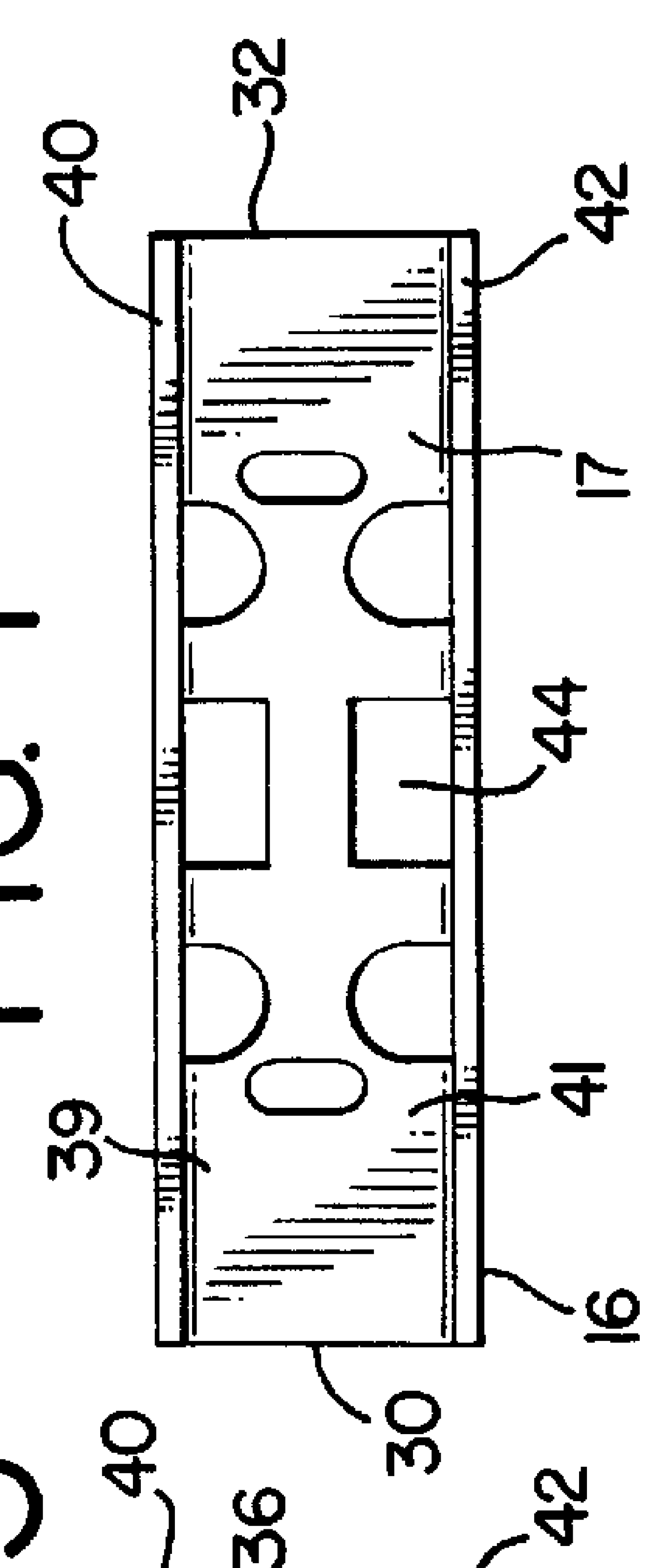

FIG.4

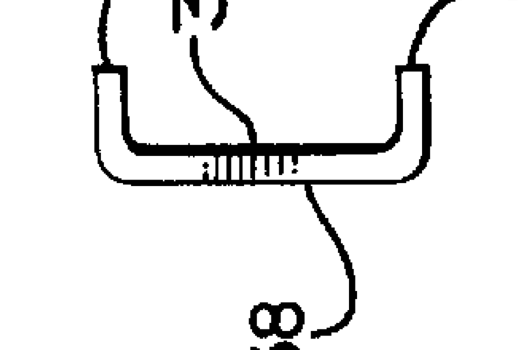

FIG.5

FUSIBLE LINK FOR CABLE ASSEMBLY AND METHOD OF MANUFACTURING SAME

TECHNICAL FIELD

The invention relates to the field of electrical protection, and is particularly directed to a fusible link for protecting electrical devices.

BACKGROUND OF THE INVENTION

Automobiles are increasingly reliant on electronic controls and engine management systems. As a result of these controls and systems, modern automobiles are much more dependable than prior autos, which instead used more vulnerable mechanical systems. Although the hardware embodying the electronic controls and systems is rather dependable, the failure of the means for directly or indirectly bringing electrical current to such hardware continues to be a rare but, nevertheless, significant source of automotive breakdowns. An automotive breakdown, especially in a deserted area or on a very busy high-speed road, is obviously a safety hazard to the automobile and its passengers.

One specific type of failure in prior art means can lead to an even more hazardous condition than automotive breakdown. The failure results when the junctions between the fusible link and the cables loosen, causing a high resistance between the fusible link and cable. The increased resistance leads to high temperatures in these regions. One cause of the failure at the connection of the fusible link and the cable is due to the flexibility of the fusible link. If the fusible link is not sufficiently rigid it may twist and bend during use of the cable assembly, thereby causing the connection between the fusible link and the cable to fail. Under certain conditions the increased temperatures can reach sufficiently high levels to split the insulation on the conventional copper-wire fusible links, initiating an engine compartment fire that can quickly destroy the automobile and endanger its occupants.

U.S. Pat. No. 5,591,366 issued to Schmidt et al. discloses a series of protective coverings over a heating wire connected to a power wire. The heating wire is connected in series to an electrical pin which directly joined to a fuse wire. The fuse wire is then joined to the power wire. Two opposing metal caps are bonded on their inner surfaces to a ceramic tube to form a hermetically sealed shell surrounding the junctions between the fuse wire and pin, and between the fuse wire and power wire. Then, a heat shrinkable tubing is used to grip the caps and ceramic tubing, encasing the fuse area.

Like other prior art devices, the disclosure of U.S. Pat. No. 5,591,366 does not solve the problem of protecting failure at the junctions of the fusible link.

Accordingly, a fusible link for a cable assembly in accordance with the present invention eliminates the drawbacks of the prior art devices described above.

SUMMARY OF THE INVENTION

According to one aspect of the present invention, a fusible link is provided for a cable assembly. The fusible link has a link segment having a first member extending transversely from the link segment, and a second member extending transversely from the link segment. The link segment is adapted to be electrically connected to first and second cables of the cable assembly.

According to another aspect of the present invention, the link segment has a first end and a second end, a first surface and a second surface, and a first side and a second side. The first end of the link segment is adapted to engage the first cable of the cable assembly and the second end of the link segment is adapted to engage the second cable of the cable assembly to electrically connect the fusible link with the first and second cables. The first member extends from the first side of the link segment and the second member extends from the second side of the link segment. The first and second members are transverse to the link segment.

According to another aspect of the present invention, the first member extends in a first direction transverse from the link segment, and the second member extends in a second direction from the link segment. In one embodiment, the second direction is substantially the same direction as the first direction. In another embodiment the second direction is substantially the opposite as the first direction.

According to another aspect of the present invention, the link segment is substantially planar and a plurality of apertures extend through the link segment. The fusible link may be made of a first conductive material that is the same as the conductive material as the first and second cables, and a second conductive material having a lower melting temperature than the first conductive material may be deposited on the link segment.

According to another aspect of the present invention, a method of manufacturing the fusible link is provided. The method includes providing a strip of conductive material having a first surface and a second surface. An aperture is created in the conductive material. The aperture extends from the first surface of the conductive material to the second surface of the conductive material. Additionally, transverse members are created on the fusible link.

According to another aspect of the present invention, the step of creating the transverse members comprises bending a first side of the strip of conductive material at an angle to the first surface to create a first transverse member, and bending the second side of the conductive material at an angle to the first surface to create a second transverse member.

According to another aspect of the present invention, a method of manufacturing a plurality of fusible links is provided. The method includes dicing the strip of conductive material into individual fusible links prior to creating the transverse members.

According to yet another aspect of the present invention, an additional step is provided including adding a second conductive material having a lower melting temperature than the first conductive material on one of the first and second surfaces of the fusible link. The second conductive material is added adjacent the aperture in the conductive material.

Other features and advantages of the invention will be apparent from the following specification taken in conjunction with the following drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

To understand the present invention, it will now be described by way of example, with reference the accompanying drawings in which:

FIG. **1** is an exploded perspective view of the cable assembly, including a protective housing andthe fusible link of the present invention;

FIG. **2** is a top plan view of a strip of conductive material utilized to create a plurality of fusible links of the present invention;

FIG. 3 is a top plan view of one fusible link of the present invention;

FIG. 4 is a top plan view of the fusible link of FIG. 1;

FIG. 5 is a side elevation view of the fusible link of FIG. 4;

FIG. 6 is a top plan view of another embodiment of the fusible link; and,

FIG. 7 is a side elevation view of the fusible link of FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

While this invention is susceptible of embodiments in many different forms, there is shown in the drawings and will herein be described in detail preferred embodiments of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the broad aspect of the invention to the embodiments illustrated.

Referring now in detail to the Figures, and initially to FIG. **1**, there is shown a preferred embodiment of the fusible link **16** of the present invention. The fusible link **16** is generally utilized with a cable assembly **10**, including a first cable **12** and a second cable **14** connected to ends of the fusible link **16**, and a protective housing **18** encasing the fusible link **16**. The present fusible link **16** is an improvement over prior art fusible links in that it provides a rigid member to electrically connect the first and second cables **12, 14**. Thus, the present invention offers stability and safety features previously not available with prior fusible links.

As shown in FIG. **1**, the first and second cables **12,14** are conventional insulated electrical cables and are generally comprised of a core of a plurality of elongated strands of wires **20** surrounded by a protective insulation layer **22**, such as polyethylene. Nonetheless, a solid wire or cable could be employed as the core for the present invention in lieu of a stranded cable. The cable core **20** is made of a first material, preferably a conductive metal, and more preferably copper. Each of the cables **12,14** generally have a first or proximal end **24**, and a second or distal end **26**. A portion of the protective covering **22** or insulation adjacent the first or proximal end **24** of each cable is removed or stripped away from the cable. Preferably, approximately a ½" portion of insulating covering **22** is removed from the first end **24** of the cable. Thus, the end portion of the cables or wires extends past their respective protective coverings **22**.

In the preferred embodiment of the present invention the first cable **12** is made of 6 gauge wire. The first cable **12** may have a terminal **28** at the second or distal end **26** of the cable for connecting the cable to a power source (not shown). The second cable **14** is similarly made of a 6 gauge wire. The second cable **14** may have a terminal **28** at the second or distal end **26** of the cable for connecting to a desired electrical device (not shown) such as the starter of an automobile. Even though a 6 gauge wire is utilized in the preferred embodiment, much larger and much smaller gauge wires, for example, from 10 gauge up to at least 2 gauge or larger, may be used as either the first cable, the second cable, or both the first and second cables. Furthermore, it is understood that the gauge thickness of the first cable could be different from the gauge thickness of the second cable.

The fusible link of the preferred embodiment is illustrated in FIGS. **1**, and **4–7**. The fusible link **16** is adapted to be electrically connected to the first and second cables **12,14** of the cable assembly. The fusible link **16** comprises a link segment **17** having a first end **30** and a second end **32**, a first surface **36** and a second surface **38**, and a first side **39** and a second side **41**. Generally, the link segment **17** is substantially planar. The first end **30** of the link segment **17** is adapted to engage the first cable **12**, and the second end **32** of the link segment **17** is adapted to engage the second cable **14**. Further, first and second members **40,42** extend from the link segment. In the preferred embodiments of the present invention, the first member **40** extends from the first side **39** of the link segment **17**, and the second member **42** extends from the second side **41** of the link segment **17**. The first and second members **40,42** are transverse to the link segment **17**. The transverse members **40,42** of the fusible link **16** provide superior bending strength and rigidity for the fusible link **16**.

One preferred embodiment of the fusible link of the present invention is illustrated in FIGS. **4** and **5**. In this embodiment the first transverse member **40** extends in a first direction transverse from the link segment **17**, and the second transverse member **42** extends in a second direction which is substantially the same direction as the first member **40**. The first member **40** and the second member **42** extend from or are adjacent one of the surfaces **36,38** of the link segment. As shown in FIG. **4**, the first member **40** extends from the first surface **36** adjacent the first side **39** thereof, and the second member **42** extends from the first surface **36** adjacent the second side **41** thereof. Thus, both the first and second members **40,42** extend away from the link segment **17** in the same direction (away from and adjacent to the first surface), and the fusible link **16** of this embodiment is approximately U-shaped. As shown in FIG. **5**, the first and second members **40,42** are substantially perpendicular to the link segment **17**. The transverse members **40,42**, however, need not be at exact right angles (i.e., at 90°) to the link segment **17**, and are generally within ±30° of 90°.

The improved rigidity in the fusible link **16** is provided from the transverse portion of a member adjacent the link segment **17** of the fusible link **16**. Accordingly, any angle that the first and second members **40,42** depend from the link segment **17** provides improved rigidity. Preferably, the first and second members **40,42** extend at least at a 30° angle to the link segment **17**. More preferably, the first and second members **40,42** extend at least at a 45° angle to the link segment **17**. Most preferably, the first and second members **40,42** extend at an angle between 45° and 90° to the link segment **17**.

Another preferred embodiment of the fusible link of the present invention is illustrated in FIGS. **6** and **7**. In this embodiment the first transverse member **40** extends in a first direction transverse from the link segment **17**, and the second transverse member **42** extends in a second direction which is substantially the opposite direction as the first member **40**. Thus, the first member **40**, the link segment **17**, and the second member **42** form the shape of an "S" or "Z." As shown in FIG. **7**, the first member **40** extends from or adjacent the first surface **36** of the link segment **17** adjacent the first side **39** thereof, and the second member **42** extends from or adjacent the second surface **38** of the link segment **17** adjacent the second side **41** thereof. Like the embodiment illustrated in FIGS. **4** and **5**, the first and second members **40,42** are substantially perpendicular to the link segment **17**. Also like the above embodiment, the transverse members **40,42** need not be at exact right angles (i.e., at 90°) to the link segment **17**, but are generally within ±30° of 90°.

The fusible link **16** is generally a 0.032 inch thick piece of conductive material, preferably copper or a copper alloy. In the preferred embodiment, the fusible link **16** is made of the same conductive metal, i.e. copper, as the first and second cables **12,14**. Notwithstanding the above, the fusible link **16** can be made of any suitable conductive metal which can form a fuse element that, when properly configured, melts to open the circuit under both short circuit conditions and under prolonged modest overload conditions.

Further, in both of the above-described preferred embodiments, a plurality of apertures or cutouts **44** extend through the link segment **17** of the fusible link **16**. The apertures **44** create regions of high electrical resistance. Additionally, a second conductive material **48** having a lower melting temperature than the material of the fusible link **16** may be distributed on the fusible link **16** adjacent the apertures **44** to lower the melting temperature of the fusible link. Preferably a tin or tin/lead spot **48** is distributed on the upper or first surface **36** of the fusible link **16** for such purposes.

The fusible link **16** is manufactured by conventional stamping and bending techniques. The method of manufacturing the fusible links **16** described above generally begins with providing a substantially planar strip of conductive material **19** having a first surface **36** and a second surface **38**. Next, the apertures **44** are created in the strip of conductive material as shown in FIG. **3**. The apertures **44** extend through the strip from the first surface **36** thereof, to the second surface **38** thereof. The apertures **44** may be created by any method, including stamping, punching, and with the use of lasers and chemicals.

The next step includes creating members **40,42** transverse to the first and second surface **36,38** of the link segment **17**. Generally, this is accomplished by bending a portion of the conductive material adjacent the first and second sides **39,41** of the link segment **17**. In the preferred embodiments, a portion of the material at the first side **39** of the strip of conductive material is bent at an angle to the first surface **36** to create the first transverse member **40**, and a portion of the material at the second side **41** of the strip of conductive material is bent at an angle to the first surface **36** to create the second transverse member **42**. The angle may be positive or negative, as shown in FIG. **7**. In the embodiment of FIG. **7**, the first transverse member **40** extends roughly 90° from the first surface **39**, while the second transverse member **42** extends roughly −90° from the first surface **39**.

Additionally, as shown in both FIGS. **4** and **6**, the first and second transverse members **40,42** extend in a direction from the first end **39** of the fusible link to the second end **41** of the fusible link. Notwithstanding the preferred embodiment which includes bent sides, the transverse members **40,42** may be additional material connected to the link segment **17** of the fusible link **16**. Further, the transverse members **40,42** may extend the entire length from the first end **30** of the fusible link **16** to the second end **32** of the fusible link **16** as shown in FIG. **4**, or the transverse members **40,42** may extend along a portion of the sides **39,41** of the fusible link **16** as illustrated in FIG. **6**. As shown in FIG. **1**, if the transverse members **40,42** extend the entire length from the first end **30** to the second end **32** of the fusible link **16**, they provide additional retaining means for the cables **12,14**.

As shown in FIG. **2**, the method of manufacturing the fusible links **16** allows for manufacturing a plurality of links simultaneously. As such, a strip of conductive material is provided **19**. The strip is much longer than a single fusible link **16**. The process commences as if a single fusible link **16** were being manufactured. As such, a plurality of apertures **44** are created in the strip of material **19**. The apertures **44** are located in appropriate clusters for each resulting fusible link. After the strip **19** has the appropriate apertures therein, the strip is diced into individual link segments **17**. The strip may be diced lengthwise or widthwise, depending on the configuration of the fusible link. Each diced link segment **17** from the long strip **19** shown in FIG. **2** becomes an individual link segment **17** as shown in FIG. **3**. Once the link segments **17** are diced, the transverse members **40,42** are created as described above.

Additionally, a second conductive material **48** may be placed on one of the first and second surfaces **36,38** of the fusible link. As shown in FIG. **1**, the second conductive material **48** is preferably located adjacent one of the apertures **44**.

The first end portion **24** of each of the first and second cables **12,14** is electrically connected to the fusible link **16** adjacent the opposing first and second ends **30,32** of the fusible link, respectively. The first end portion **24** of the first cable **12** is electrically connected to the fusible link **16** adjacent the first end **30** of the fusible link, thereby creating a first connection point. Similarly, the first end portion **24** of the second cable **14** is electrically connected to the fusible link **16** adjacent the second end **32** of the fusible link, thereby creating a second connection point. As such, the fusible link **16** is located between and electrically connects the first and second cables **12,14**. The means for electrically connecting the cables **12,14** to the fusible link **16** is preferably accomplished by brazing the cable to the fusible link. Other means, including compressing, welding, soldering and sonic welding, can be employed as well. As shown in FIG. **1**, the first cable **12** and the second cable **14** are preferably connected to the top surface of the fusible link **16**, and between the transverse sides **40,42** thereof.

As shown in FIG. **1**, the protective housing **18** comprises a pair of housing members. Preferably, the pair includes a first housing member **60** and a second housing member **62**. Each housing member **60,62** is generally made of a heat resistant plastic material. The protective housing **18** itself, as well as the first and second housing members **60,62** of the protective housing, each have a first end portion **72**, a second end portion **74**, and an intermediate section **76** therebetween. The first end portion **72** of each housing member has a first cavity **78**, the second end portion **74** of each housing member has a second cavity **80**, and the intermediate section **76** of each housing member has an intermediate cavity **82**. The intermediate cavity **82** of the first and second housing members has a greater volume than that of the first and second cavities **78,80** of the first and second housing members. The protective housing **18** securably engages the first and second cables **12,14**, to prevent both axial and rotational movement of the cables **12,14**. As such, a much more rigid assembly is provided to prevent loosening or breaking of the connection between the first and second cables **12,14** or wires and the fusible link **16**. Additionally, features of the housing **18** provide for increased protection for the components within the housing **18** from outside elements.

The first and second housing members **60,62** each have a shoulder **68** and groove **70** therein. One shoulder **68** is adjacent a side of each of the first and second housing members **60,62**. Similarly, one groove **70** is adjacent the opposing side of each of the first and second housing members **60,62**. The shoulder **68** that extends from the first housing member **60** mates with the groove **70** in the second housing member **62** when the first and second housing members **60,62** are coupled, and the shoulder **68** that extends from the second housing member **62** mates with the groove **70** in the first housing member **60** when the first and second housing members **60,62** are coupled. The grooves **70** and shoulders **68** not only operate as a locating means for the first and second housing members during coupling thereof, but the mated shoulders **68** and grooves **70** also provide a seal area about the sides of the protective housing **18**.

The first and second housing members **60,62** also have interconnecting members **64,66** which mate to assist in locating the first and second housing members **60,62** together for coupling thereof The interconnecting members comprise a post **64** and a mating aperture **66**. Each housing member **60,62** has a post **64** at the first and second end portions **72,74** of each respective housing member **60,62**. The posts are adjacent one of the sides of the respective housing member **60,62**. Additionally, each housing member **60,62** has an aperture **66** at the first and second end portions **72,74** of each respective housing member **60,62**. The apertures **66** are adjacent the opposing side of the respective housing member **60,62** as that of the posts **64**. Accordingly, the post **64** at the first end portion **72** of the first housing member **60** mates with the aperture **66** at the first end portion **72** of the second housing member **62**, the post **64** at the second end portion **74** of the first housing member **60** mates with the aperture **66** at the second end portion **74** of the second housing member **62**, the post **64** at the first end portion **72** of the second housing member **62** mates with the aperture **66** at the first end portion **72** of the first housing member **60**, and the post **64** at the second end portion **74** of the second housing member **62** mates with the aperture **66** at the second end portion **74** of the first housing member **60**. When coupled, the protective housing **18** covers the fusible link **16** and portions of the first and second cables **12,14**.

As shown in FIG. **1**, when the first and second housing members **60,62** are coupled together to form the overall protective housing **18**, the protective housing **18** can be said to have a first channel portion **84** at a first end **72** thereof which houses a portion of the first cable **12**; a second channel portion **86** at the second end **74** thereof which houses a portion of the second cable **14**; and, an intermediate channel portion **88** between and connecting the first channel **84** and the second channel **86** which houses the fusible link **16**. The first channel portion **84** is comprised of the first cavity **78** of the first and second housing members **60,62**, the second channel portion **86** is comprised of the second cavity **80** of the first and second housing members **60,62**, and the intermediate channel portion **88** of the protective housing **18** is comprised of the intermediate cavities **82** of the first and second housing members **60,62**. The individual channel portion **84,86,88** cooperate to form a continuous channel extending from the first end **72** of the protective housing **18** to the second end **74** of the protective housing **18**. The intermediate channel **88** houses the fusible link **16**. A portion of the intermediate channel **88** is spaced a distance away from the fusible link **16** to create a gap between the fusible link **16** and an interior wall of the intermediate channel **88**.

The protective housing **18** further has a plurality of ribs **90,91** extending into the channel. As shown in FIG. **1**, in the preferred embodiment, two first ribs **90** and two second ribs **91** extend from the protective housing **18** and into the channel at the first end portion **72** of the protective housing **18**, and two first ribs **90** and two second ribs **91** extend from the protective housing **18** and into the channel at the second end portion **74** of the protective housing. More specifically, in the preferred embodiment a first rib **90** extends from the first housing member **60**, at both the first and second end portions **72,74** thereof, and into the channel; and, a second rib **91** extends from the first housing member **60**, at both the first and second end portions **72,74** thereof, and into the channel. Similarly, a first rib **90** extends from the second housing member **62**, at both the first and second end portions **72,74** thereof, and into the channel; and, a second rib **91** extends from the second housing member **60**, at both the first and second end portions **72,74** thereof, and into the channel.

The first and second housing members **60,62** have a longitudinal axis (L) which generally extends from the first end **72** of the respective housing member to the second end **74** of the respective housing member. The first ribs **90** of the first and second housing members **60,62** generally extend about a portion of the longitudinal axis (L) of the respective housing member **60,62**. Accordingly, when the first and second housing members **60,62** are coupled to form the protective housing **18**, the first ribs **90** extend axially from the protective housing **18**. The second ribs **91** are transverse to the first ribs **90**, and conversely, the first ribs **90** are transverse to the second ribs **91**. In the preferred embodiment, the second ribs **91** extend substantially perpendicular to the first ribs **90**. As such, in the preferred embodiment the second ribs **91** do not have to be at exact right angles to the first ribs **90**.

Moreover, in the preferred embodiment the first housing member **60** and the second housing member **62** are identical components. Even though the protective housing **18** has been described as having a first housing member **60** and a second housing member **62**, the protective housing **18** can be comprised of either two first housing members **60**, or two second housing members **62**, that is a pair of housing members. To mate the housing members, one housing member is rotated **180** degrees to allow the mating grooves/shoulders and posts/apertures to correspond.

The first and second ribs **90,91** at the first end portion **72** of the first and second housing members **60,62** contacts the protective covering **22** of the first cable **12** to grip and contain the first cable **12** at the first end portion **72**, and the first and second ribs **90,91** at the second end portion **74** of the first and second housing members **60,62** contacts the protective covering **22** of the second cable **14** to grip and contain the second cable. Generally, the ribs **90,91** comprise a protrusion extending from the housing member. In the preferred embodiment, the ribs **90,91** have an apex for securely engaging the cable. Further, in the preferred embodiment the ribs **90,91** at the first end portion **72** extend from an interior wall of the first channel and the ribs **90,91** at the second end portion **74** extend from an interior wall of the second channel. When the two housing members **60,62** of the protective housing **18** are mated and firmly connected together, portions of the ribs **90,91** are indented into the insulative layer **22** of the cable. This allows the engaging ribs **90,91** to securely grip and contain the cable **12,14** such that the cable is not capable of movement with respect to the protective housing **18**. Specifically, the first ribs **90** which extend about a portion of the longitudinal axis (L) of the protective housing **18** prevent rotational movement of the cables **12,14** with respect to the protective housing **18**. And, the second ribs **91** which extend transversely to the first ribs **90** prevent axial movement of the cables (i.e., movement of the cables into and out of the protective housing). By having ribs that are transverse to other ribs, whether the transverse ribs are perpendicular to the axial ribs or not, any type of movement of the cable with respect to the protective housing is substantially eliminated. Preventing movement of the cable with respect to the protective housing assists in ensuring that the cable assembly will not fail at the connection points of the cables and the fusible links. Additionally, having transverse members **40,42** depending from the fusible link **16** further assists in prevent failure of the connection points. As such, the first cable **12**, the protective housing **18**, the fusible link **16**, and the second cable **14** form a unitary element when the protective housing **18** is secured around the cable assembly.

The inside diameter of the first and second cavities **78,80**, and thus of the formed channels **84,86** can be varied to accommodate different size cables. Additionally, the height of the ribs **90,91** may vary accordingly with the variation in the cavity diameter. For a 6 gauge cable the cavity diameter is approximately 0.266" and the height of the ribs are 0.032". For an 8 gauge cable the cavity diameter is approximately 0.182" and the height of the ribs are 0.032". For a 4 gauge cable the cavity diameter is approximately 0.310" and the height of the ribs are 0.032". Even though the cavity diameter and rib height can be varied, a small change in the size of the cable does not necessarily require a change in the cavity diameter of the housing. The parameters of the cavity **84,86** and ribs **90,91** are such that a certain size cavity can accommodate small increases and decreases in the diameter of the cable **12,14**.

Once the first and second housing members **60,62** are mated around and over the fusible link **16** and portions of the first and second cables **12,14**, the first and second housing members **60,62** are fixedly connected with rivets **93** which extend through apertures **94** in the housing members **60,62**. In the preferred embodiment apertures **94** for rivet **93** are located adjacent each of the four corners of the protective housing **18**. It should be known however, that the first and second housing members **60,62** could be fixedly connected by any other means, including adhesives, welding, or any other connecting means. By fixedly connecting the first and second housing members **60,62** together, the ribs **90,91** are maintained securely in the protective covering **22** of the cables **12,14** to maintain the cables in place. As such, the cable **12,14** and fusible link **16** are securely connected to the housing **18**.

While the specific embodiments have been illustrated and described, numerous modifications come to mind without significantly departing from the spirit of the invention, and the scope of protection is only limited by the scope of the accompanying Claims.

We claim:

1. A fusible link for a cable assembly comprising:

a link segment having a first end and a second end, a first surface and a second surface, and a first side and a second side, wherein a first member extends from the first side of the link segment and a second member extends from the second side of the link segment, the first and second members being substantially planar and further being transverse to the link segment, and wherein the first end of the link segment is adapted to engage a first cable of the cable assembly and the second end of the link segment is adapted to engage a second cable of the cable assembly.

2. The fusible link of claim **1**, wherein the first member extends in a first direction transverse from the link segment, and wherein the second member extends in substantially the same direction as the first member.

3. The fusible link of claim **1**, wherein the first member extends in a first direction transverse from the link segment, and wherein the second member extends in substantially an opposite direction as the first member.

4. The fusible link of claim **1**, wherein the first member and the second member extend adjacent the first surface of the link segment.

5. The fusible link of claim **1**, wherein the first member extends adjacent the first surface of the link segment, and wherein the second member extends adjacent the second surface of the link segment.

6. The fusible link of claim **1**, wherein the first and second members extend substantially perpendicular to the first surface of the link segment.

7. The fusible link of claim **1**, wherein the link segment is substantially planar.

8. The fusible link of claim **7**, wherein a plurality of apertures extend through the link segment.

9. The fusible link of claim **7**, wherein the fusible link is made of a first conductive material, and wherein a second conductive material is deposited on the link segment, the second conductive material having a lower melting temperature than the first conductive material.

10. The fusible link of claim **1**, wherein the fusible link is made of a conductive material that is the same conductive material as the first and second cables.

11. The fusible link of claim **1**, wherein the fusible link is made of a conductive material that is an alloy of the conductive material of the first and second cables.

12. A fusible link for a cable assembly, comprising:

a link segment having a first member extending transversely from the link segment, and a second member extending transversely from the link segment, the link segment adapted to be electrically connected to first and second cables of the cable assembly, wherein the link segment has a first end and a second end, and wherein the first and second members extend adjacent the first end to adjacent the second end.

13. The fusible link of claim **12**, wherein the link segment has a first surface and a second surface, and a first side and a second side, wherein the first member extends from the first surface of the link segment, and wherein the second member extends from the second surface of the link segment.

14. The fusible link of claim **13**, wherein the first member extends from the first surface adjacent the first side thereof, and wherein the second member extends from the second surface adjacent the second side thereof.

15. The fusible link of claim **12**, wherein the link segment a first surface and a second surface, and a first side and a second side, and wherein the first member and the second member extend from the first surface of the link segment.

16. The fusible link of claim **15**, wherein the first member extends from the first surface adjacent the first side thereof, and wherein the second member extends from the first surface adjacent the second side thereof.

17. The fusible link of claim **12**, wherein the first member extends in a first direction from the link segment, and wherein the second member extends in a second direction from the link segment.

18. The fusible link of claim **17**, wherein the second direction is substantially the same direction as the first direction.

19. The fusible link of claim **17**, wherein the second direction is substantially the opposite direction as the first direction.

20. The fusible link of claim **12**, wherein a plurality of apertures extend through the link segment.

21. A method of manufacturing a fusible link for a cable assembly comprising the steps of:

providing a substantially planar strip of conductive material having a first surface and a second surface, and a first end and a second end;

creating an aperture in the conductive material, the aperture extending from the first surface to the second surface;

creating members transverse to the first and second surface of the conductive material, the transverse members extending from substantially the first end to the second end.

22. The method of claim 21, further comprising the step of dicing the strip into individual fusible links prior to creating the transverse members.

23. The method of claim 21, further comprising the step of adding a second conductive material on one of the first and second surfaces, the second conductive material having a lower melting temperature than the first conductive material, the second conductive material being added adjacent the aperture in the conductive material.

24. The method of claim 21, wherein the strip of conductive material has a first side and a second side, wherein the first side of the strip of conductive material is bent at an angle to the first surface to create a first transverse member, the first transverse member extending in a direction from the first end to the second end, and wherein the second side of the strip of conductive material is bent at an angle to the first surface to create a second transverse member, the second transverse member extending in a direction from the first end to the second end.

25. The method of claim 21, further comprising the step of connecting the first end of the fusible link to a first cable and connecting the second end of the fusible link to a second cable.

26. The method of claim 21, further comprising the step of creating a plurality of apertures in the conductive material, the apertures extending from the first surface to the second surface of the conductive material.

27. A fusible link for a cable assembly, comprising:

a link segment having a first surface and a second surface, and a first side and a second side, the link segment further having a first member extending transversely from the link segment and a second member extending transversely from the link segment, wherein the first member extends adjacent the first surface of the link segment, and wherein the second member extends adjacent the second surface of the link segment, the link segment adapted to be electrically connected to first and second cables of the cable assembly.

28. The fusible link of claim 27, wherein the first member extends from the first side of the link segment and wherein the second member extends from the second side of the link segment.

29. The fusible link of claim 27, wherein the first member extends in a first direction from the link segment, and wherein the second member extends in a second direction from the link segment.

30. The fusible link of claim 29, wherein the second direction is substantially the opposite direction as the first direction.

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